LAWRENCE
LIVERMORE
NATIONAL
LABORATORY

LLNL-PROC-687042

Hot electron generation from Stimulated Raman Scattering in direct-drive-relevant conditions at the National Ignition Facility*

P. Michel, C. Goyon, D. Turnbull, E. Dewald, F. Hartemann, L. Masse, L. Divol, J. D. Moody, M. Rosenberg, A. Solodov, J. Myatt, W. Seka, M. Hohenberger, S. Regan

March 29, 2016

12th Direct Drive and Fast Ignition Workshop
Bordeaux, France
April 25, 2016 through April 27, 2016

Disclaimer

Hot electron generation from Stimulated Raman Scattering in direct-drive-relevant conditions at the National Ignition Facility*

P. Michel[1], M. Rosenberg[2], C. Goyon[1], D. Turnbull[1], A. Solodov[2], J. Myatt[2], W. Seka[2], E. Dewald[1], F. Hartemann[1], M. Hohenberger[2], L. Masse[1], L. Divol[1], S. Regan[2] and J. D. Moody[1]

[1]Lawrence Livermore National Laboratory, P.O. Box 808, Livermore, California 94551-0808, USA
[2]Laboratory for Laser Energetics, University of Rochester, 250 East River Road, Rochester, New York 14623-1299, USA

We report on analyses of recent experiments at the National Ignition Facility (NIF) aimed at investigating suprathermal electron generation processes in conditions relevant to direct-drive experiments with laser energies at the megajoule level. These experiments use planar targets in order to eliminate uncertainties associated with crossed-beam energy transfer (CBET). Measurements of stimulated Raman scattering (SRS) spectra show excellent agreement with simple calculations based on ray-tracing of the laser and single-beam SRS; in particular, these results establish a predictable correlation between the SRS spatial origin inside the target and its exit direction in the target chamber. These measurements indicate that contrary to what was anticipated (and traditionally observed in experiments at the Omega laser facility), a significant fraction of the suprathermal electrons in NIF experiments (if not most of them) might be generated by SRS rather than two-plasmon decay (TPD). We also show that these experiments have conditions that might satisfy the requirements for the existence of multi-beam SRS, where multiple laser beams can collectively drive a shared electron plasma wave and generate collimated "beams" of suprathermal electrons [1,2].

[1] P. Michel et al., "Multibeam Stimulated Raman Scattering in Inertial Confinement Fusion Conditions", *Phys. Rev. Lett*. **115**, 055003 (2015)
[2] E. L. Dewald et al., "Generation and Beaming of Early Hot Electrons onto the Capsule in Laser-Driven Ignition Hohlraums", *Phys. Rev. Lett*. **116**, 075003 (2016)

*This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract No. DE-AC52-07NA27344

This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.